

A new species of venomous coral snake (Serpentes: Elapidae) from high desert in Puebla, Mexico

Jonathan A. Campbell

Department of Biology, The University of Texas at Arlington,
Arlington, Texas 76019, U.S.A.

Abstract.—A new species of coral snake (*Micrurus pachecogili*) is described from southern Puebla, Mexico. Black body rings in this snake are monadal and the species is allopatric from all other coral snakes except perhaps *M. laticollaris*, a species in which black body rings are in triads. The new species is characterized by distinctive, well developed yellow rings, relatively short red rings, and a relatively large number of ventral scutes in comparison with *M. nebularis*.

Resumen.—Se describe una nueva especie de serpiente coral (*Micrurus pachecogili*) del sur de Puebla, México. En esta serpiente, los anillos corporales negros son monodales; la nueva especie es alopatrica de otras serpientes de coral, tal vez con excepción de *Micrurus laticollaris*, una especie en la que los anillos negros se disponen en triadas. La nueva especie se caracteriza por poseer anillos amarillos bien desarrollados, anillos rojos relativamente cortos y un número grande de escamas ventrales en comparación con *M. nebularis*.

Species of coral snakes are widespread, if not always conspicuous, components of New World herpetofaunal assemblages. They occur throughout most of the Neotropics and reach into both temperate North and South America. These snakes are often associated with mesic conditions and the majority of species occur in rainforest or cloudforest habitats. Coral snakes appear to be delicate and desiccate quickly when exposed to direct sunlight. Thus, most species are nocturnal or are active only during early morning or later afternoon, especially on rainy nights or overcast days. However, a fair number of coral snakes have become adapted to subhumid habitats, occurring in desert, thorn scrub, or tropical deciduous forest from the Sonoran Desert of the southwestern U.S.A. southward on the Pacific coast of Mexico and Central America and in various regions in South America. In Pacific Mexico, tropical deciduous forest is inhabited by *Micurus browni*, *M. distans*, *M.*

ephippifer, *M. bogerti*, *M. laticollaris*, *M. proximans*, and *Micruroides euryxanthus*, with the latter species also extending into the Sonoran Desert (Campbell & Lamar 1989).

The arid lands of southern Puebla are situated in the northern part of the Mesa del Sur physiographic region and are just south of the Mesa Central (West 1964, fig. 3). Heretofore, this area was reported to harbor only a single species of coral snake, *M. laticollaris* (Campbell & Lamar 1989, Roze 1996), easily distinguishable from other Mexican coral snakes in being one of two species with black body rings in triads (the other triadal species being *M. elegans* of mesic forests on the eastern versant). Some years ago, I traversed on multiple occasions the countryside surrounding Zapotitlán Salinas in southern Puebla, during which time I assembled small collections of amphibians and reptiles. Among the material in these collections are two specimens of a species of coral snake that cannot be associated with any species known from Mexico.

Materials and Methods

Descriptions of characters and terminology of scales in the diagnosis and description of this new taxon follow Campbell & Lamar (1989) and Roze (1996). The sex of individuals was confirmed by checking for the presence of hemipenes by making a small midventral incision on the proximal section of the tail. Head measurements were taken to the nearest 0.1 mm using digital calipers held under a dissecting scope and the snout-vent and total length was taken to the nearest 1.0 mm using a meter stick.

Micrurus pachecogili, new species (Figs. 1–3)

Holotype.—An adult male (Figs. 1–2), UTA R-12546 (original number JAC 9752), from 5.6 km SSW Zapotitlán Salinas, 1494 m, Puebla, Mexico, collected in November 1983 by one of the children of E. Pachecogil. This locality is in high tropical arid forest at 18°18'N, 97°31'W (Fig. 3).

Paratype.—A subadult male, UTA R-17145, from the type-locality, collected in December 1985.

Diagnosis.—*Micrurus pachecogili* differs most notably from other species of *Micrurus* in central Mexico in being tricolored and having black body rings in monads (i.e., a body pattern of red-yellow-black-yellow-red), in having 220–223 ventrals in males, in possessing a wide pale parietal ring that includes all of the parietals and portions of adjacent scales, and in having non-melanized red body rings that are about equal to or shorter than black body rings. Indeed, these four characters, in combination, distinguish *M. pachecogili* from all other venomous Mexican coral snakes.

Micrurus bernadi differs in having mostly red and black body rings, although a yellow parietal ring and, rarely, narrow yellow edging may be present along black markings, black rings are usually reduced to dorsal spots or saddlelike bands, and males have 198–212 ventrals. *Micrurus browni* differs in having a black nuchal ring that covers the

posterior portion of the parietals and adult males have supraocular keels. In *M. b. browni* of Guerrero and Oaxaca, the subspecies that is geographically most proximate to Zapotitlán, males have 204–218 ventrals, the black head cap extends to the anterior part of the parietals and frontal, and the black nuchal ring covers the ultimate and penultimate supralabials (versus only the posterior edge of the ultimate supralabial). *Micrurus diastema* differs in that the red rings are either very long (>5 times wider than the black rings) or contain scales that are distinctly black-tipped, the black head cap includes the anterior portion of the parietals and/or the black nuchal ring includes the posterior portion of the parietals. *Micrurus distans* of western Mexico differs in having no more than 17 black body rings, males have ≤217 ventrals, and red body rings are usually at least three times longer than black rings. *Micrurus ephippifer* differs in having a black nuchal ring that covers the parietal tips, red rings have black-tipped scales, spots, or large saddlelike bands, and ≤219 ventrals in males. *Micrurus laticollaris* has black body rings arranged in triads (i.e., body pattern of red-black-yellow-black-yellow-black-red), has 1 + 2 temporals, and males possess ≤215 ventrals. *Micrurus limbatus* is bicolored with red and black rings and ≤192 ventrals. Overall, the color pattern of *M. pachecogili* is most similar to that of *M. nebularis*: similarities include red and black rings of relatively equal length, scales in red rings not black-tipped or distinctly spotted, well developed yellow body rings (1.0–1.5 dorsal scale lengths long in *M. nebularis* versus 2.0 in *M. pachecogili*), and tail with subequal black and yellow rings. *Micrurus nebularis* differs by having a black nuchal ring that covers the posterior ends of the parietals, 203–208 ventrals in males, and seven black tail bands.

Description of holotype.—A single prenasal and postnasal on each side; nostril situated mostly in posterior part of prenasal; an elongate preocular on each side contacting postnasal; no loreal; anterior scales on head

and snout, including mental and infralabials, with numerous tiny tubercles; postoculars 2/2; temporals 1 + 1 + 2; upper tertiary temporal large, about half size of parietal; supralabials 7/7; infralabials 7/7 (Fig. 1); ventrals 223; cloacal scute divided; subcaudals 47, all divided except proximal subcaudals 2–7; dorsal scale rows smooth, in 15 unreduced rows; no supraclacal keels.

Dimensions are as follows: head length 15.0 mm, head width 10.9 mm, total length 639, tail length 87 mm (comprising 13.6% of total).

The black head cap covers the rostral, first three supralabials, the upper and anterior edge of Supralabial 4, the anterior edge of the upper preocular, slightly more than three-fourths of the supraoculars, and about half of the frontal; there is no pale spot on snout. The yellow parietal ring extends from the black head cap to include all of the parietals, the primary and secondary temporals, and anterior part of the tertiary temporals, and all of the ultimate supralabial except for the posterior edge (Fig. 1). About half or slightly more of the lingual portion of the mental and the first three pairs of infralabials are black; the posterior gular area is immaculate yellow and continuous with the yellow parietal ring. The black nuchal ring does not reach the posterior tips of the parietals and involves less than half of the first dorsal scale situated partially between the parietals. The nuchal ring extends posteriorly along the middorsum $\sim 1/2 + 5 + 1/2$ dorsal scales; it is shortened ventrally to cover most of the first two ventrals and adjacent 1.5 preventrals. There are 24 black body rings, including the nuchal, with the posteriormost just anterior to the vent. Throughout most of the body black rings are about four dorsal scale lengths long, but the anterior three rings behind the nuchal ring are slightly longer, being about 4.5–5.5 scales in length (Fig. 2). On the belly, most black body rings are reduced to about three ventrals (one ring covers only two ventrals and several cover four), with an additional half ventral (divided along midventral line) associated with

many rings. Black body rings tend to have vertical edges or, if shortened on the side of the body, they are reduced by no more than about 0.5 scale lengths. The yellow rings are immaculate and relatively wide throughout the body, being about two dorsal scales long. The cloacal scute is yellow. Most red rings are 3–4 scales in length with a few reduced to as short as one and one-half to two scale lengths on the posterior half of the body. Scales in the red rings are mostly immaculate but with slightly dusky free margins and there are a few irregular, inconspicuous black dots in a few of the red rings. There are five black tail rings that are one and one-half to three times the width of the yellow rings separating them; the tip of the tail is yellow.

Variation.—The paratype (UTA R-17145) is a subadult male, 327 mm in TL, with a tail length of 36, comprising 11.0% of the total. It agrees with the holotype in most respects of scutellation and pattern, but has 220 ventrals, 43 subcaudals (subcaudals 2–3 not divided); a black nuchal ring involving only the first ventral plus adjacent two and one-half preventrals; 27 black body rings, most of which are about four dorsal scales in length throughout the body; red body rings which are two to three dorsal scales in length throughout the body; and 6 black tail rings, exclusive of the black tail tip, which are 1.5–2 times longer than the yellow rings separating them.

Etymology.—The species name is a noun in the genitive case, formed in honor of Emiglio Pacheco Gil, a good friend and longtime resident of the Zapotitlán Valley. He, his wife, and about twelve children (I never knew the total number and am not sure he did either) always were gracious and hospitable hosts during my visits, most willing to share whatever meager provisions they had available. The country around Zapotitlán is harsh and Emiglio supplemented his income by working in the onyx mines which abound in the region. He was killed in a mining accident in 1982.

Remarks.—The morphology of coral

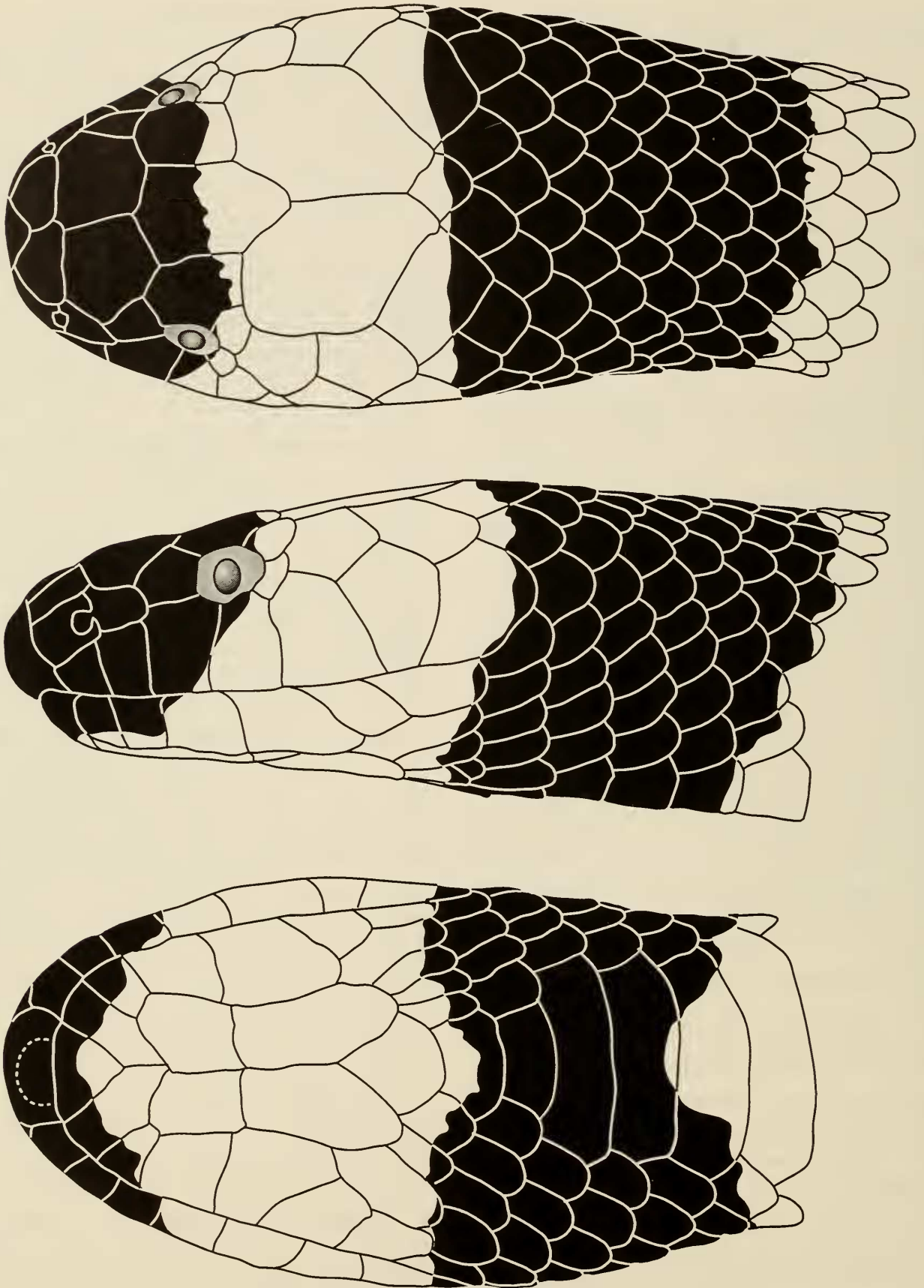


Fig. 1. Dorsal, lateral, and ventral aspects of the head of *Micrurus pachecogili* (holotype, UTA R-12546). Head length = 15.0 mm.



Fig. 2. Dorsal aspect of *Micrurus pachecogili* (holotype, UTA R-12546). Total length = 639 mm.

snakes is extremely conservative (Slowinski 1995) and the numbers and arrangement of most head scales, rows of dorsal scales, and even skull and dentition is remarkably consistent, with minor exceptions, throughout *Micrurus* (Campbell & Lamar 1989, Roze 1996). Perhaps, the most dramatic adaptation within the genus is the conspicuous elongation of the body apparent in certain coral snakes including the genus *Leptomicrocrurus* and various species of *Micrurus* in Lower Central America and northern South America. Many species of coral snakes are diagnosed primarily on the basis of color pattern and this has proven to be a generally reliable method for distinguishing most species, although a few species are notoriously variable (e.g., *Micrurus diastema*) which has resulted in a tangled taxonomic history for several species.

The habitats of coral snakes also may be useful for species identification, although many species occur over several ecological associations and may have elevational dis-

tributions of over 2000 m. Nevertheless it is worth noting that heretofore only a single species of coral snake has been reported from southern Puebla, namely *M. laticollaris*, a distinctive species and one of only two species in Mexico possessing black body rings arranged in triads. *Micrurus laticollaris* occurs on the west coast of Mexico in Jalisco, Colima, and Michoacán and through much of the Balsas Basin and associated tributaries into southern Puebla where it may be sympatric with *M. pachecogili*.

The distributions of a number of other species of *Micrurus*, all with monadal black body rings, approach the Zapotitlán Valley within about 150 km, but are characterized by markedly different habitats. The region around Zapotitlán is dry, being in a rain-shadow valley. This region receives about 250–350 mm of precipitation annually, and the valley floor and surrounding slopes are covered by arid scrub forest dominated by many species of cactus. *Micrurus bernardi* occurs in northern Puebla in tropical ever-

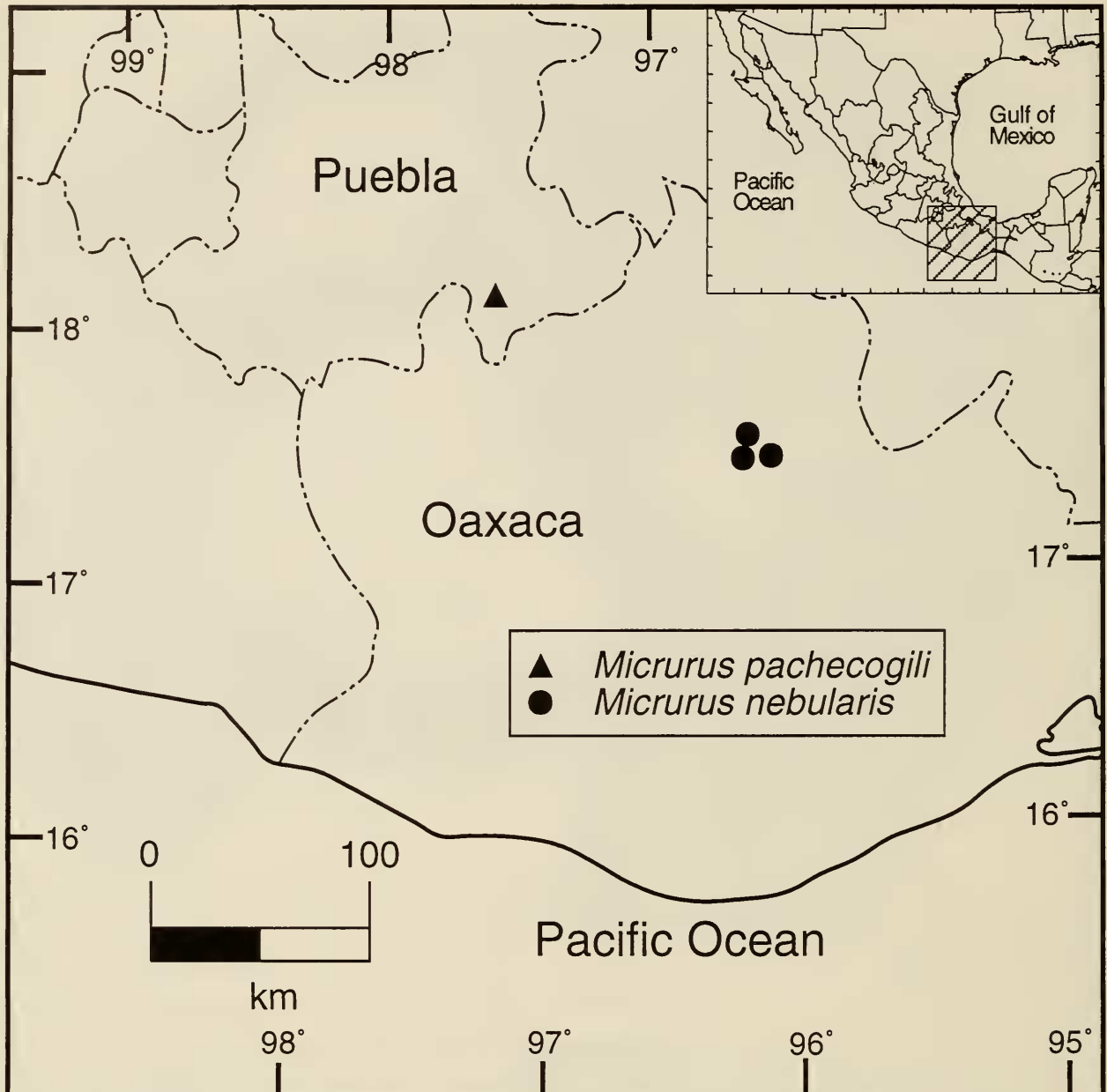


Fig. 3. Distributions of two species of coral snakes, genus *Micrurus*, from the highlands of southern Mexico.

green forest and cloudforest at elevations of 50 to about 2000 m. There is some evidence that this taxon is conspecific with *M. diastema* (Pérez-Higareda & Smith 1990), also known from the eastern versant of Mexico, but this allocation has not been universally accepted (Roze 1996). *Micrurus browni* is known from the subhumid coastal tropical forest, tropical deciduous forest, and dry pine-oak forest of southern Mexico from about sea level to over 2000 m. The extremely variable *M. diastema* inhabits tropical evergreen forest and cloudforest of eastern Puebla and adjacent Veracruz and Oaxaca, as well as in subhumid forests over

most of the Yucatán Peninsula. It ranges from near sea level to about 1250 m. *Micrurus ephippifer zapotecus* occurs in highland pine-oak forest of central Oaxaca at elevations of 1700–2400 m; another apparently closely related population, *M. e. ephippifer*, occurs at lower elevations (100–1500 m) in tropical deciduous forest and in the ecotone of this forest with pine-oak forest. *Micrurus nebularis* occurs in pine-oak forest at elevations of 2100–2300 m on the southern slopes of the Sierra de Juárez in central Oaxaca; all known specimens have been collected in the vicinity of Ixtlán de Juárez (Fig. 3).

During the course of my investigations around Zapotitlán, I collected a series of distinctive *Lampropeltis triangulum* which subsequently became the type-series of a new subspecies (Quinn 1983). This snake closely resembles *M. pachecogili*, having relatively long yellow body rings and narrow red rings, thus serving as one more compelling example of mimicry.

Acknowledgments

I thank the Officials from the Dirección General de Flora y Fauna Silvestre for issuing collecting permits for Mexico. Howard Arnott kindly took the photograph in Fig. 2. For help at various times in the field, I appreciate the efforts of Barry Armstrong, William Lamar, and David Hillis.

Literature Cited

- Campbell, J. A., & W. W. Lamar. 1989. The venomous reptiles of Latin America. Cornell University Press, Ithaca, 425 pp.
- Pérez-Higareda, G., & H. M. Smith. 1990. The endemic coral snakes of the Los Tuxtlas region, southern Veracruz, Mexico.—Bulletin of the Maryland Herpetological Society 26:5–13.
- Quinn, H. 1983. Two new subspecies of *Lampropeltis triangulum* from Mexico.—Transactions of the Kansas Academy of Science 86:113–135.
- Roze, J. A. 1996. Coral snakes of the Americas: biology, identification, and venoms. Krieger Publishing Company, Malabar, Florida, 328 pp.
- Slowinski, J. B. 1995. A phylogenetic analysis of the New World coral snakes (Elapidae: *Leptomicrus*, *Micruoides*, and *Micrurus*) based on allozymic and morphological characters.—Journal of Herpetology 29:325–338.
- West, R. C. 1964. Surface configuration and associated geology of Middle America. Pp. 33–83 in R. Wauchoppe and R. C. West, eds., Handbook of Middle American Indians, vol. 1, Natural Environment and Early Cultures. University of Texas Press, Austin, 570 pp.